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ABSTRACT

A course in communications skills for the biomedical sciences is a component unique to the New Mexico State University MARC Honors Undergraduate Program. The program seeks to identify and assist minority students who show evidence of having clear potential to perform at a high level in the biomedical sciences and who show a determination to enter graduate programs leading to a Ph.D. degree. The major objectives of the course are to teach the students to (1) present research papers at scientific meetings; (2) speak to lay groups about their scientific research; (3) write articles for scholarly journals, and (4) write papers on scientific topics for laymen. The method of attack includes analysis of journal articles as to the major divisions of a paper, functions of individual sentences, and flaws in writing. Differences between top level writing for scientists or for laymen are also examined. Tape recordings from scientific meetings provide examples of good and poor spoken presentations and special attention is devoted to repetition of ideas, discourse cues, stylistic integrity and use of visual ideas. Student written work, oral video taped presentations, group editing practices, and instruction in writing proposals are also included. The course helps students to see writing as a process and become aware of the steps necessary to produce a polished piece of work. (Author/DS)

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BIOMEDICAL COMMUNICATION SKILLS FOR MINORITY STUDENTS

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INTRODUCTION.--Nowadays, one can scarcely imagine a literate American still unaware of the concentration of minority groups in the lower strata of income, education, occupation, status, and the like.[1] Minorities are coming to be better represented in the education profession and, to a lesser extent, in the social sciences, but they still lag far behind in the physical and biological sciences. The latter fact was underscored in the March 1977 announcement of the then-new Minority Access to Research Careers (MARC) Honors Undergraduate Research Training Program, funded through the National Institute of General Medical Sciences:

> The proportion of the U.S. citizens holding doctoral degrees who are members of minority groups is strikingly lower than the percentage of minority U.S. citizens. While 12 percent of the population is Black, less than 0.25 percent of persons holding a Ph.D. in sciences are Black. The figures are even lower for Black Ph.D.s in the biomedical sciences. Furthermore, the number of doctorates, both M.D.s and Ph.D.s, in other ethnic minority groups (such as American Indians or Chicanos) is proportionally lower than for Blacks. The number of Blacks and

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> and members of other minority groups currently being trained for the doctorate is correspondingly small.[2]

The MARC Honors Undergraduate Program, then, is a deliberate attempt to remedy the deficit by identifying, at the undergraduate stage, minority students". . .who show evidence of having clear potential to perform at a high level in the biomedical sciences and who show a determination to subsequently enter graduate programs leading to the Ph.D. degree. . ."[3] A total of sixty-seven applications were received in response to the original circular; twelve awards were made to minority institutions to begin programs in the fall of 1977.[4] One of those was to New Mexico State University.

NMSU MARC PROGRAM.--At NMSU, as at the other institutions, each MARC trainee is assigned to a scientific preceptor, an active researcher in a biomedical specialty, for one-to-one tutoring and supervision in ongoing research, and, in general, the last undergraduate year of the trainee is enriched by (1) paid attendance at a professional meeting, preferably to read a paper or give a poster session on current work; (2) regularly scheduled lectures from visiting scientists; and (3) an externship of a summer's or a semester's length at a research facility of national reputation. In the words of the team which made a site visit to our campus: "In brief, the honors student will be treated, to a very large extent, as an actual graduate might be treated and thus will be exposed at a formative stage in his training to a research environment.[5]

COMMUNICATION SKILLS COURSE.--The NMSU MARC program contains a component not found in any of the others: a three-hour course in communications skills for the biomedical sciences, one which is designed to meet the special needs of the MARC trainees and which is offered each spring. According to the original proposal, the major objectives for the course are to teach students to:

1. present research papers at scientific meetings
2. speak to lay groups about their scientific research
3. write articles for scholarly journals
4. write papers on scientific topics for laymen

Other topics suggested for study during the semester include the writing of letters of inquiry about positions, telephone behavior, and proposal writing.

Before the beginning of the spring semester, various evaluations of the student's language arts skills are conducted. The reading portion of the McGraw-Hill[6] is administered; each trainee is evaluated for speech, hearing, and vocabulary development at the NMSU Speech and Hearing Clinic. In addition, each preceptor is invited to comment specifically on his trainee's strengths and weaknesses. Students submit specimens of recent writing, and at the first class session, a sample of their formal speaking performance is videotaped. Each MARC student is obligated to meet the major course objectives, as detailed above. Also, individual objectives for each student are set on the basis of the preliminary assessment of skills.

MATERIALS.--There is, to my knowledge, no available textbook focused exclusively on biomedical sciences, particularly on avian respiratory

physiology and on two specialties in biochemistry. Availability of textbook for the course is further limited by the fact that both speaking and writing are included in the objectives. And even if there were a useful textbook on the market, I probably would not use it. First, I want to dissociate the MARC communications skills course from previous textbook-oriented writing or speech courses, on the chance that some previously generated negative after-effects linger on. Second, I do not want to put the MARC students through an externally derived sequence of topics, but rather, to limit instruction to exactly what they need. Since the 1978 course had five students and the 1979 four, it has been easily possible for me to focus exclusively on their needs. Third, I want to approximate for the students the real life situation of practicing scientists: the sources for stylistics are in the productions of others, not in textbooks; help in writing will be given by colleagues. The last reason became quite important during 1978, when that first group of alert and able students challenged me at many points, and I was able to send them to original souces for answers to their questions.

The models we use for various objectives are as follows:

OBJECTIVE	MODEL
spoken scientific papers	tape recordings of 15-20 minute papers from December 1977 joint meeting of American and Canadian zoological societies (Toronto)
journal articles	published articles recommended by MARC faculty
lay articles	Scientific American

letters of application	letters received in Speech Department inquiring about advertised job
proposals	guidelines (NSF) plus successful proposal written by local MARC director

For the lay spoken presentation, I review principles of public speaking; I present Grice's conversational postulates[7] and deduce appropriate telephone behavior from them, which provides a little variety of subject matter for the course and which elevates answering the telephone in a laboratory to a level worthy of study.

METHODS.--The method of attack for the communications skills course is analysis of model and matching to sample. We began in 1978 with a detailed study of the function of individual sentences in journal articles, how they serve the writer's purpose in the various sections of his work. I should add here that I found the analysis fascinating, but the students did not. For 1979, I have therefore elected to begin with more general analysis of the major divisions of papers (Introduction, Methods and Materials, Results, and Discussion) and to proceed to the functional sentence analysis farther into the semester. Use of the articles submitted by MARC preceptors involves certain drawbacks. Some of the specimen journal articles are well written others less so. As for the poorly written ones, the 1978 MARC students were extremely adept at filling in, supplying missing information; their knowledge of the subject matter effectively prevented them from concentrating on the writing itself. Moreover, I got some grousing from the physiologists when we read biochemical papers, and vice versa. To ease both difficulties, I switched to the study of an experimental paper in speech pathology, one

exceedingly badly written, putting all the students on the same footing insofar as background was concerned and enabling them to spot writing flaws easily. This provided them with experience in editing, which I believe essential to the process of writing.

Differences between top level writing for scientists and for laymen can be illustrated nicely by a comparison of two articles on the same topic by a single writer, the first[8] for physiologists, the second[9] for the general educated reader. The order of information is the same in both, but in the latter, there is no formal citation of the work of others and there is addition of interesting information not suitable for journal articles. In addition, a comparison of the two provides stimulus for discussion of presuppositions, i.e., what information the writer assumes the reader brings.

For the spoken scientific presentations, we analyze one very good and one not so good presentation from the Toronto meeting, with special attention to repetition of ideas, discourse cues, stylistic integrity, and use of visual devices. Comparisons of differences between speech and writing are undertaken, with background from a lecture on Vachek's[10] comparison of the two forms of language use.

STUDENT WORK.--For the production of their own work, students first write an outline of their research and its scientific background, in an order suitable for journal publication. The handling of the information is then compared to that of the spoken presentation: it is pointed out, for example, that literature citation is shortened for the spoken form. The order of presentation for journal articles is also compared to that of the proposal,

to show that the material is roughly the same for the two, except that results and discussion for the proposal are, of course, couched in conjectural terms. It is important for science students to know how to write proposals, since many federal agencies will finance worthy dissertation research if a good proposal is submitted and in addition, since continued research in the biomedical specialities is dependent on obtaining funds through proposal writing.

Production of student work is a continuous process of editing and revision. As students produce portions of their oral presentations, we videotape them for group commentary and revision. Finished presentations are given before classes of international students, with feedback to the MARC trainees from their English teachers, and to high school science classes. As trainees produce portions of their writings, we project them via the opaque projector for group editing, following which individuals edit each other's work, which precedes an editorial conference with me. During writing and editing, I extract common problems to make class exercises on punctuation, noun-verb agreement, and the like. We discuss tense use in scientific prose, article use, whatever the students evidence a need for, at the time when it seems most appropriate.

VARIETY OF ENGLISH.--In 1978, I was assisted by a graduate student in general speech. During the semester, as we were taping oral presentations, the GA had occasion to "correct" a morpheme pronunciation: a MARC trainee had said /in/ where the GA would have said /iŋ/. That well-intentioned but, to my mind, misguided attempt to alter variety of English provided an appropriate occasion for the discussion of varieties of American English and their

function in personal and social identification. Four of the five MARC students were Chicanos, the fifth Amerindian (Pueblo). They had all acquired standard syntax; certainly, their speech and writing were in this respect indistinguishable from their peers'. Indeed, it was much more standard than the speech and writing of many students on our campus, both majority and minority. Three had retained ethnic phonological features in varying degree, which put them in a situation roughly similar to that of President Carter: standard syntax + nonCronkheit phonology. We discussed the nation's history of prejudice focused on ethnic speech variety, including the fact that prejudice appears to be declining. I indicated that courses and tutoring were available to assist any student who chose to acquire a standard phonology. No student elected to change.

I applaud the students' apparent disinterest in "standardizing" themselves, yet I recognize that the decision is affected in part by external factors. Two prominent biomedical scientists on our faculty, with whom all biomedical students are in close contact, provide models of successful professionals who have retained ethnic phonological systems. Furthermore, there is an active NMSU student organization devoted to recruiting Chicano faculty members and Chicano undergraduates into the biomedical sciences. One of the 1978 MARC students had been instrumental in founding the organization and was serving as its president. Finally, before the establishment of the MARC program, the trainees had already been recruited into the minority Biomedical Support (MBS) Program, which, in addition to providing support for minority students over the country at both undergraduate and graduate levels, sponsors

state, regional, and national meetings at which minority students present papers. These models and reminders of ethnicity must act, I believe, as a spur to the retention of a strong ethnic component in speech. What will happen after graduation? Since the goal of the MARC program is to place students in graduate schools to obtain doctorates, ours typically move from New Mexico to complete their training. Three left to continue at Harvard, Stanford, and Iowa. I imagine that during their years of graduate study, they will necessarily be separated from such strong pressures to maintain ethnicity and that they will strengthen identification with the national biomedical community, which may bring a drift toward standard phonology.

POST SCRIPT.--The 1978-79 MARC group comprises five new students, all Chicanos. One has the most marked ethnic phonology of all ten; in addition, his writing evidences nonstandard features, chiefly, absence of past participial morpheme. Since the present paper was written after only two sessions of the communication skills course, I did now know the student well enough to predict his performance by the end of the semester.

EVALUATION.--Three means of informal evaluation were employed. (1) The performance of students who presented papers at professional meetings and spoke to campus classes was reported as good. One from among the original group spoke at the top biomedical meeting in the country and did extremely well. (2) None of the students emerged at the end of the semester as a finished writer, but all had made substantial gains, as demonstrated in their papers. Most important, they had come to see writing as a process and had become aware of the steps to go through in order to produce a polished piece of work.

(3) I solicited a narrative evaluation of the course from the class, which showed them grateful to have been required to think carefully about what they put on paper, instead of getting by with the "usual junk I turn in for a lab report," in the words of one. Most asked for more oral work, which students who come later will get.

Finally, the MARC faculty are preparing a one-year follow-up questionnaire to be distributed toward the end of the spring 1979 semester, to find out from graduates how they fared in their first year away and how the NMSU MARC program contributed. The real measure of MARC success will come later, as students receive their doctorates and become biomedical scientists.

NOTES

[1]The present paper, partially funded by N.I.H. Grant 5T32 GM07667-02, was presented at the 1979 Annual TESOL Convention, Boston, February 27-March 4.

[2]Minority Access to Research Careers Guidelines, N.I.G.M.S., March, 1977, 1.

[3]Ibid., 2.

[4]N.I.G.M.S. Annual Report for FY 1978, 95.

[5]Report of Site Visit Team, 4.

[6]Reading Test, McGraw-Hill Basic Skills System, Alton L. Raygor, ed.

[7]Grice, H.Paul, "Logic and Conversation," in Syntax and Semantics. Vol. 3. Speech Acts, Peter Cole and Jerry L. Morgan, eds. (New York: Academic Press, 1975) 41-58.

[8]Tucker, Vance A., "Respiratory Exchange and Evaporative Water Loss in the Flying Budgerigar," J. Exp. Biol. 48:67-87.

[9]_____, "The Energetics of Bird Flight," Scientific American 220:70-78.

[10]Vachek, Josef, "Some Remarks on Writing and Phonetic Transcription," in Readings in Linguistics. II, Eric P. Hamp et al., eds., (Chicago: University of Chicago Press, 1966) 86-93.